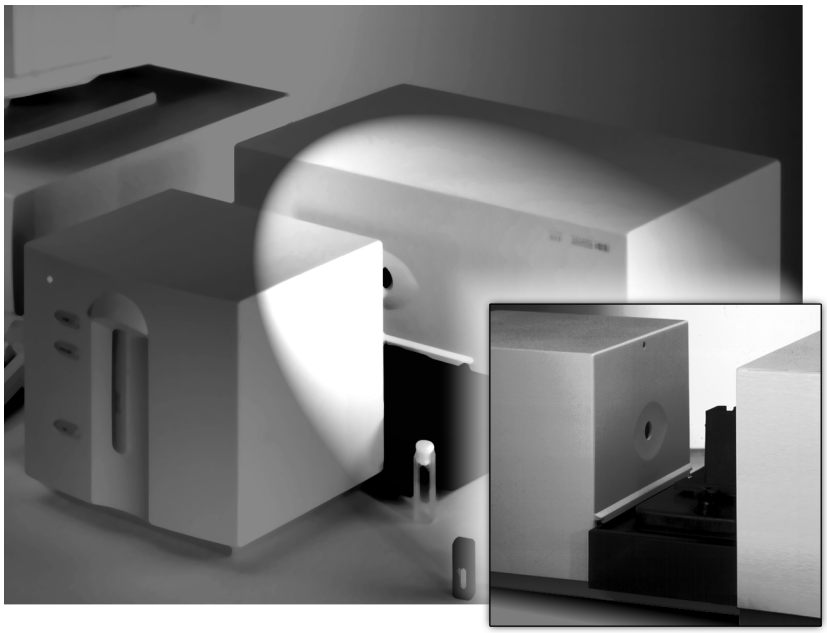
The Agilent 8453 Spectrophotometer and Open Sample Area

Technical Note



Introduction

Conventional mechanical scanning spectrophotometers have sample areas with a cover which must be closed during measurement. In contrast, diode-array spectrophotometers such as the Agilent 8453 have completely open sample areas. This note explains the reason why this is so and lists the benefits of an open sample area.

Conventional Optics

Figure 1 shows a simplified optical diagram of a conventional spectrophotometer. Such instruments use so-called "forward optics" configuration, that is, the monochromator comes before the sample. The detector has a relatively large area and is placed close to the sample. Ambient light can easily reach the detector either directly or by simple reflections and would cause erroneous measurements. For this reason the sample areas of conventional spectrophotometers are fitted with hinged light-tight covers which must be opened to exchange samples and securely closed during the measurement process. If the cover is not completely closed erroneous measurements will result.

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Diode-array Optics

Figure 2 shows a simplified optical diagram of a diode-array spectrophotometer. It uses the so-called “reverse optics” design with the “polychromator” placed after the sample. Because of the geometry of the optics it is virtually impossible for room light to reach the diode-array detector. Even if light can get through the very narrow slit at the entrance to the polychromator its direction means that it falls on the blackened walls of the polychromator where it is absorbed. Only light traveling along a narrow angle around the source axis can reach the detector. A cover for the sample area is not necessary.

Benefits

The benefits of an open sample area are:

1. Better productivity—exchanging samples is quicker and easier.
2. Simplified operation with accessories—it is easier to build in all kinds of accessories since light-tightness is not an issue. There is more flexibility regarding the physical size of the accessory and some accessories (such as Peltier temperature controllers) can operate better because they are not enclosed.
3. More reliable results—potential errors due to improperly closed cover are eliminated.

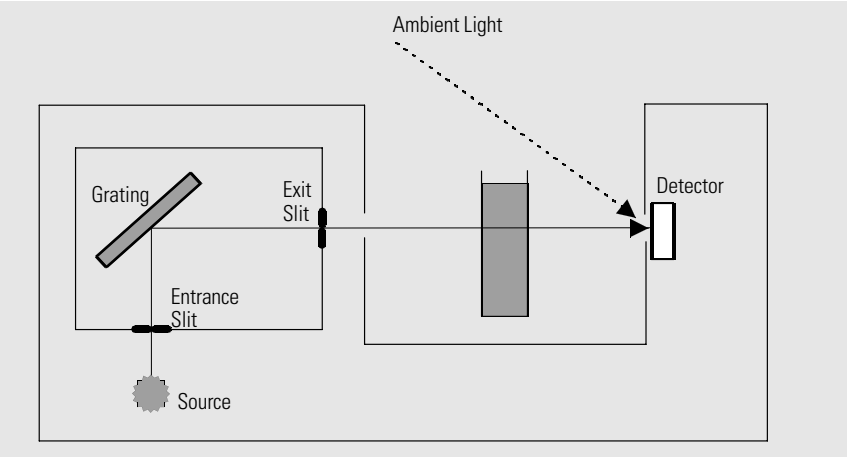

Figure 1
Simplified schematic of a conventional spectrophotometer

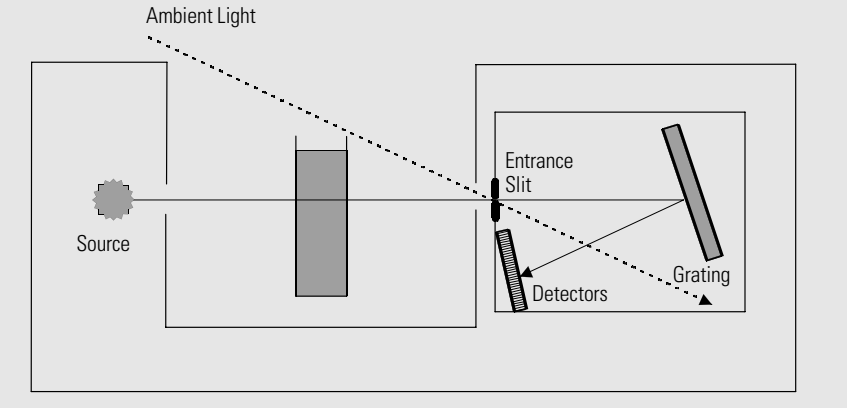

Figure 2
Simplified schematic of a diode-array spectrophotometer

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Publication Number 5965-9504E

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